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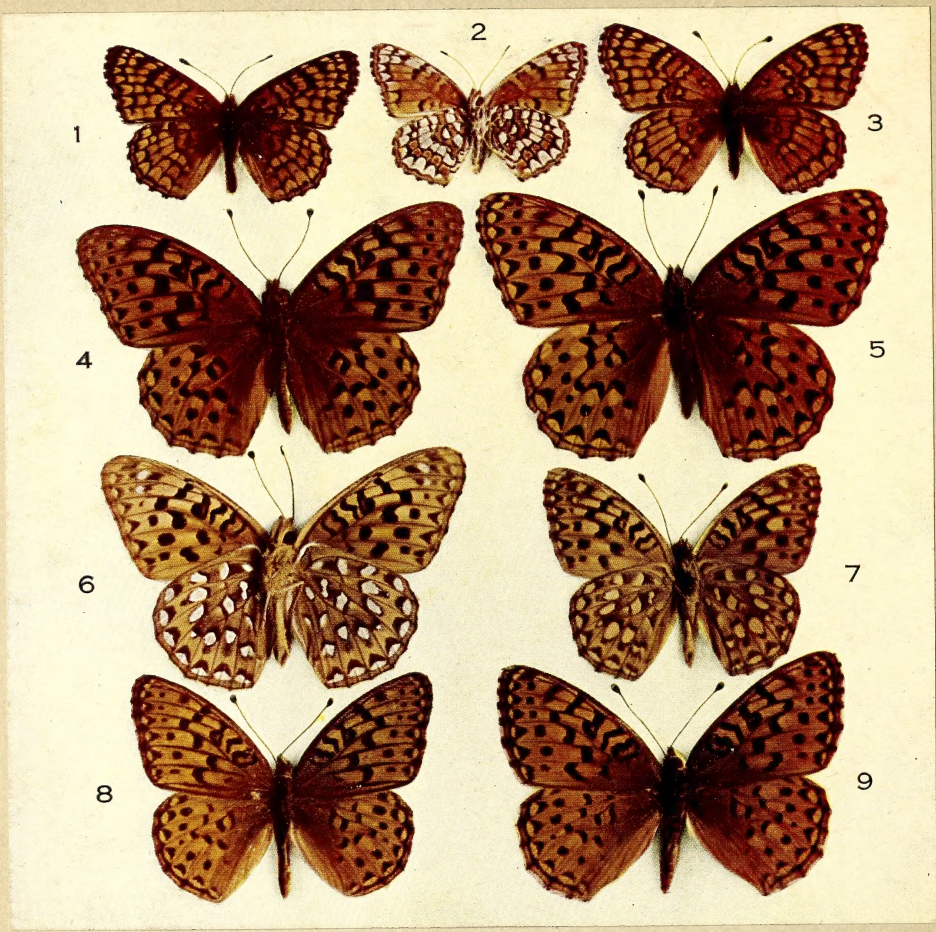

Fig. 1. MEL. SABINA, Wright. April 1, 1917. Cochise Co., Ariz.

Fig. 2. MEL. SABINA, Wright. Male Under Side, March 26,1917. Cochise Co., Ariz.

Fig. 3. MEL. SABINA, Wright. Female, April 4, 1917. Cochise Co., Ariz.

Fig. 4. ARG. MALCOLMI, Male. Type Casa Diablo Mono Co., Cal., July 22, 1918.

Fig. 5. ARG. MALCOLMI, Female. Mammoth, Cal., Aug. 17, 1918.

Fig. 6. ARG MALCOLMI, Male, Under Side. Mammoth, Cal., Aug. 18, 1918.

Fig. 7. ARG. TEHACHAPINA, Male, Under Side. Tehachapi Mts., Cal., July 18, 1918.

Fig. 8. ARG. TEHACHAINA, Male Type. Tehachapi Mts., Cal., July 18, 1918.

Fig. 9. ARG TEHACHAPINA, Female. Tehachapi Mts., Cal., July 18, 1918.

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SOUTHWEST SCIENCE BULLETIN

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THE SOUTHWEST SCIENCE BULLETIN
A DEBUT

In publishing the initial number of the Southwest Science Bulletin, the Southwest Museum is, in one sense, offering no new candidate for a place among the multitude of scientific journals. The issue is planned to succeed the various publications that have in times past voiced the activities of the Museum, and of certain affiliated organizations. Among these predecessors were the Bulletin of the Southwest Society of the Archaeological Institute of America, which ceased publication with the disincorporation of that organization, and Lorquinia, which discontinued under that title with the January, 1919, issue. The Lorquin Club as a body has decided to devote its energies in co-operation with the several clubs and associations of the Museum, toward building a strong bulletin under the above title. This activity will be under the general supervision of the Council of the Southwest Science Association, an advisory board that is made up of the executive officers of the following organizations: the Lorquin Natural History Club, the Conchological Club, the Wild Flower Club, the Bird Lovers' Club and the Archaeology Club. These form the quintet that is most active in the program of educational activity fostered by the Museum. By means of this activity the many valuable collections and records contained in the Museum are made to live, and are brought into useful contact with the community at large.

All who are interested in the development of science and the cultural arts are urged to become affiliated with some one of these associations, and to take out membership in the Museum.

EDUCATIONAL ACTIVITIES AND AFFILIATED SOCIETIES OF THE SOUTHWEST MUSEUM

Bird Lovers' Club. Meets once a month in the Museum and conducts numerous field excusions. Open to all bird lovers. No dues. Mary Mann Miller, President.

Conchological Club. Meets on the second Tuesday of each month, except July and August. Field excursions by individual members. Free to all who are interested in the study of shells. Mrs. Elsie M. Chace, Secretary; Dr. Frank Clark, President.

Lorquin Natural History Club. Holds monthly meetings in the Museum. Lectures conducted, and numerous field excusions participated in during the year. Has an entomological section which meets in the Museum on the fourth Tuesday of each month, at 8 o'clock p. m. Membership fee $1.50 annually, or $2.50 with joint membership in the Southwest Science Association.

Wildflower Club. Meets for study and field work throughout the wildflower season, and for lectures and business sessions in the Museum.

Belle I. Smith, Pres. Paula Dunnigan, Sec'y.

A NEW SPECIES OR RACE OF ARGYNNIS FROM CALIFORNIA

Dr. John A. Comstock

My friend, Mr. George Malcolm, has presented for my consideration some very interesting lepidoptera which he collected in the Mammoth district. Two trips were made into this region, which is one of almost virgin ground for the entomologist. Mr. Malcolm is a keen observer and careful collector, and his zeal has resulted in the discovery of several new locality records, and at least one new species, which I take pleasure in naming after him.

ARGYNNIS MALCOLMI, SP. NOV.

Male, expanse 2¼ inches, 57 millimetres.

Upper side; Primaries: Uniform yellow-brown. Nervules very slightly powdered with dark scales, this powdering indistinct or totally lacking over apical area, and at base. Marginal band, a faint double line, nearly suppressed at apex. A submarginal row of crescents, the anterior three partly or wholly suppressed. A limbral row of six circular spots, the posterior three large, the anterior tending toward suppression. A wavy extra-discal band of black, discontinuous at nervules, and widest in the median interspace where it measures approximately 2 millimetres. An inverted P at outer edge of disc,—internal thereto the disc is crossed by three irregular bands. The base, slightly shaded with brown, where the nervules are similarly colored.

Upper side, Secondaries: Ground color same as primaries. No shading on nervules. Fringes cream-colored except at nervules where they are yellow-brown. A narrow marginal line, more clearly defined anteriorly, fading out toward anal angle. Six or seven submarginal crescents. A limbal row of five circular spots, the central one tending toward extinction (totally missing in one specimen). Subdiscal band distinct and more or less connected, widest posterior to the disc. At outer edge of disc an inverted U or V. Base, uniform brown of a shade slightly darker than ground color.

Under side; Primaries: Ground color, creamy-buff in apical half, chocolate to reddish brown in discal half. The fringes cream, interrupted with dark brown at nervules. Marginal row, a fine double line of brown. Submarginal row of cream-colored oval spots showing in some specimens a slight silver sealing, but in the majority no silver whatsoever,—these bordered internally by a line of eight brown crescents, the posterior two darker. Two sub-apical silver spots, with a shaded border of brown. The

limbal row of circular spots reduced to three. The spots and bands of black in discal and basal areas carried through from upper side.

Under side; Secondaries: Completely silvered. Ground color, creamy-buff, with a liberal mottling of brown in the basal two-thirds of wing. Fine double marginal band. The subarginal silver row of seven ovals, shaded internally by brown crescents. The discal and basal silvered spots shaded internally by fine black lines.

Female, expanse 2 7/16 inches, 62 millimetres.

Upper side; Primaries: Differ from male principally in the fact that the ground color is lighter and less uniform and the dark markings are not suppressed over the apical area. There is also a row of eight yellow-brown submarginal ovals, corresponding to a silvered row on the under surface.

Upper side; Secondaries: Similar to male except for lighter and less uniform ground color.

Under side; Primaries: Differ from male in having a well silvered submarginal row of spots, and in the richer red-brown of the basal half of wing.

Under side; Secondaries: Same as male, except for a slightly greater amount of brown in the ground color of the basal two-thirds of wing.

This species is related to montivaga, and may, of course turn out to be a geographic race of that species.

Described from 10 males and 4 females taken by Mr. Geo. Malcolm, as follows:

8 at Mammoth, Cal., Aug. 1st to 18th, 1918 (The type, Aug. 18th).

1 at Dead Man's Creek, Mono Co., July 27, 1919.

4 at Casa Diablo Lake, Mono Co., July 22, 1919.

1 at Silver Lake, Mono Co., July 22, 1919.

Type, in the author's collection, Southwest Museum. Cotypes in the George Malcolm Collection, Los Angeles. (Plate 1, figure 4 male, figure 5 female, figure 6 male, underside.)

ARGYNNIS TEHACHAPINA, VAR. NOV.

Dr. John Comstock

During the summer of 1918 I made some extensive collections of Lepidoptera in the Tehachapi Mountains of Kern County, California. Most of the time was spent in the lower canons of the Range at an altitude of 5000 to 6000 feet, but three ascents were made of the peaks. The highest of these is 7994 feet, and is reached with difficulty through a rough brushgrown country. It is heavily timbered on its upper few hundred feet.

On July 15th I noted some six or seven small Argynnids playing about the rocks at the extreme tip of this peak. After considerable difficulty four of them were captured. They turned out to be a very distinct form from any other member of the genus found in the same locality. I am convinced, after a considerable study of the specimens, and of others closely related, that it is a race deserving of a separate name. It may be described as follows:

Argynnis montivaga, var. tehachapina, N. var.

Male: expanse 1⅝ to 1¾ inches 41 to 44.5 millimeters.

Upper side; Primaries: Uniform yellow-brown. Nervules widely margined with black. Fringes cream between nervules, black at base of nervules. Marginal band, two fine lines nearly fused into a single wide band, and completely fused at nervules. Internal to these a submarginal row of seven or eight oval brownish-yellow spots bordered internally by triangular black spots placed medially between each nervule, the anterior two indistinct. A limbal row of six circular black spots. A wide wavy extradiscal band of black, concave outward in 3rd median interspace, concave inward in 4th and 5th median interspaces. An inverted P at outer edge of disc; internal thereto an angular black line; subdiscally a black irregular oval with brownish centre. The base, delicately shaded with blackish scales.

Upper side secondaries: Ground color same as primaries. No shading on nervules except along base of upper discocellular. Marginal lines distinctly double; submarginal oval spots only complete on anterior part; open as anal angle is approached. The black triangular submarginal spots irregular, the anterior one tending to be quadrate, the next five more uniform, the seventh indistinct. The limbal row of black dots very irregular, the one between upper and lower radial nervules very large, the next smaller, and the third minute, 4th and 5th distinct. The subdiscal band of primaries is continued on secondaries not as a band, **but as a series of five elongate dashes,** showing very little tendency to connect and form a line as in other members of the group. At outer edge of disc a black quadrate spot, connected by

a fine line with the upper discocellular. Internal to this spot a faint suggestion of another. Base finely powdered with black scales.

Underside. Primaries. Ground color, brown, lightened along costal and subcostal margin with a creamy buff. Marginal lines brown; oval spots cream buff, bordered internally with dark brown triangles, the posterior two darker in color. Wavy subdiscal black band of upper side repeated, but wider; bordered externally with a shading of cream-buff, except in posterior interspace. The limbal row of black circular spots are reduced to three or four.

The subapical area is shaded with a ground color of deep brown. Other markings as on upper side.

Secondaries. Unsilvered, except for a slight suggestion on submarginal ovals. Fine double marginal lines, bounded internally by a line of seven oval cream colored (or slightly silvered) spots,—these in turn bounded by seven triangular brown spots, encroaching on a limbal band of creamy-buff. Ground color of discal and basal areas is **deep brown,** lightened in certain areas by creamy buff scales. An outer discal row of seven irregular oval spots, creamy buff, the fourth reduced to a mere spot,—and the posterior one very irregular. These are all shaded medially with black scales, and laterally with slight suggestion of brown. Three large irregular spots of same color occur on inner side of discal area, and three small spots, the centre one only distinct, are placed in the basal area. Abdomen, brown above, yellow brown below. Thorax blackish brown above, yellow brown below.

Female. Expanse 2 inches, (51 millimeters).

Upper side, Primaries. Differs from male as follows: Ground color slightly lighter, particularly in costal and subcostal area which is slightly yellowed, fringes nearly white where cream colored on male. Nervules not bordered with black, and reduced to delicate lines, submarginal oval spots, yellow brown.

Secondaries. Submarginal ovals lighter than ground color. **Underside Primaries.** Posterior half, ground color, red-brown, anterior half, cream buff. Submarginal ovals, slightly silvered anteriorly.

Secondaries. Submarginal ovals more or less silvered, also spot in centre of disc, which is double instead of single. Ground color of basal and discal areas slightly more of a purplish brown than on male.

Described from three males and one female, taken on highest peak in Tehachapi Mts., July 18, 1918. In the collection of the author, Southwest Museum, Los Angeles.

This is a southern, unsilvered race of Montivaga in my estimation. It differs from the typical in the following points:

TEHACHAPINA	MONTIVAGA
Upper Side — Primaries — Male	
Marginal lines tending to fuse	Marginal lines usually double
Submarginal oval spots narrow	Submarginal ovals wider or open (variable)
Extra-discal black band narrow	Extra discal black band nearly half again as wide
Upper Side — Secondaries — Male	
Limbal row of round spots reduced, the anterior one largest	Limbal row of round spots prominent, the posterior two largest
Extra-discal black wavy line reduced to five discontinuous oblongs	Extra-discal black wavy line continuous, sharply defined
Black markings at outer angle of disc reduced	Black marking at outer angle of disc a heavy inverted V or Y
Under Side — Primaries — Male	
Ground color, chocolate brown with blotches of creamy-buff	Ground color, creamy-buff, with shadings of yellow-on posterior half
Extra-discal line wider on under side than on upper	Extra-discal line narrower on under side than on upper
Under Side — Secondaries — Male	
Typically unsilvered	Typically silvered although unsilvered forms, and all intergrades, occur commonly
Ground color, brown	Ground color, creamy-buff
Limbal creamy-buff band reduced and inconspicuous	Limbal creamy-buff band wide and clear

This is not the unsilvered form of macaria, which Wright describes under the name of laurina. I have examined a cotype of Wright's laurina through the courtesy of Prof. Van Duzee, of the California Academy of Science, and find that it does not differ from typical macaria except for the lack of silvering—and a glance at the accompanying plate will serve to distinguish macaria from tehachapina. (Plate 1, figures 7-8-9 tehachapina).

BUTTERFLIES OBSERVED IN DEAD HORSE CANYON, CALIFORNIA, DURING 1917 SEASON

H. M. Simms

Dead Horse Canyon is the largest of the small canyons branching out of Verdugo Canyon on the western side and is situated near the southern end of the latter canyon. The entrance or mouth is small and inconspicuous, and as it is private property and opens into a large orange orchard it is not easy to find. There are several trails leading to the central and upper portions over a spur of Verdugo Mt. and the best of these is the one which starts from the top of Cambell St., Casa Verdugo, and, passing behind the reservoir, ascends to the crest of the spur in a northeasterly direction. At the summit of this ridge there is a wide trail which, leading to the northwest towards the summit of the mountain, passes the head of a steep but well defined trail about a quarter of a mile from the top of the first trail which leads down into the canyon at about the middle. Above the foot of this trail there is a somewhat overgrown trail following the bed of the stream up into the upper portion of the canyon. This upper portion is well wooded, the prevailing trees being Alder, Sycamore and Live Oak with a varied undercover in which Willow and Sallow predominate. The herbage is luxuriant and green throughout the summer. The lower portion of the canyon, i. e., the part below the foot of the trail from the ridge, is less wooded and the stream is dry during the greater part of the summer whereas there is always water in the upper part. Nevertheless there is a varied flora and plenty of bushes and near the mouth of the canyon there is a large grove of Live Oaks.

During a considerable number of visits to this canyon from February to November of this year more than 50 species of butterflies were observed and representatives of nearly all these species were captured. The following table is a brief summary of the observations made along this line:

Papilio rutulus (Boisduval) "The Western Tiger Swallowtail." Common throughout the season, especially in the more wooded portions.

Papilio eurymedon (Boisduval) "Eurymedon." Not uncommon in the earlier part of the summer.

Papilio zelicaon (Luc). Seen once or twice in the spring on the ridge above the canyon.

Pieris rapae (Linnaeus) "The Cabbage Butterfly." Common in the lower part of the canyon near the mouth.

Pieris protodice (Bdv. and Leconte) (Reakirt) "The Common White." Common in the lower part of the canyon from May to late Fall.

Pieris vernalis (Edwards).
Common early in the season.

Euchloe sara (Boisduval) "The Orange-Tip" or "Sara."
Common in spring and early summer.

Colias eurytheme (Boisduval) "Eurytheme."
Abundant throughout the summer.
Form ariadne. Common in spring.
Form keewaydin. Not uncommon in late summer and fall.

Colias harfordi (Henry Edwards)
A few specimens of this species were taken or seen during August and September.

Terias nicippe (Cramer) "Nicippe."
Not uncommon during September and October.

Meganostoma eurydice (Boisduval) "Eurydice" or "The Californian Dog-Face."
A few were seen in early spring. Common during July, August and September.
Var. amorphae was taken on October 20th.

Catopsilia eubule (Linnaeus) "The Cloudless Sulphur."
Two or three were seen in spring and again in October. These were probably "strays" from the orchards near the mouth of the canyon or the private gardens of Casa Verdugo.

Anosia plexippus (Linnaeus) "The Monarch."
Abundant throughout the season.

Dione vanillae (Linnaeus) "The Gulf Fritillary."
One or two were seen about the entrance to the canyon. These were probably "strays" from the neighboring gardens.

Melitaea chalcedon (Doubleday & Hewitson "Chalcedon."
Abundant during early summer.

Melitaea gabbi (Behr) "Gabb's Checker-spot."
Two taken in April.

Grapta satyrus (Edwards) "The Satyr."
Not uncommon in the early summer.
Form marsyas. Common in late summer.

Vanessa antiopa (Linnaeus) "The Mourning-cloak" or "Camberwell Beauty."
A few seen in September and October near the mouth of the canyon.

Pyrameis atalanta (Linnaeus) "The Red Admiral."
Not common and irregular in appearance.

Pyrameis huntera (Fabricius) "Hunter's Butterfly."
Not common.

Pyrameis cardui (Linnaeus) "The Painted Lady."
Not very common. Occurs chiefly near the mouth of the canyon.

Pyrameis caryae (Hubner) "The West Coast Lady."
Common throughout the season.

Junonia coenia (Hubner) "The Buckeye" or "Peacock."
Common, especially in the lower part of the canyon.

Basilarchia lorquini (Boisduval) "Lorqin's White Admiral."
Common in summer and fall, especially in the upper part of the canyon.

Adelpha californica (Butler) "The Californian Sister."
A few were seen amongst the Live Oaks near the mouth of the canyon in the late summer and fall.

Coenonympha california (Doubleday & Hewitson) "The California Ringlet."
Abundant throughout the spring and summer.
Form galactinus. Abundant in spring.
A yellow form (eryngii) was common in late summer.

Satyrus silvestris (Edwards) "The Dark Wood-nymph."
One or two specimens seen in August.

Lemonias virgulti (Behr) "Behr's Metal-mark."
One was taken on October 21st.

Thecla grunus (Boisduval) 'Boisduval's Hairstreak."
Common about the Live Oaks near the mouth of the canyon in August.

Thecla melinus (Hubner) "The Common Hairstreak."
Common throughout the spring and summer.

Thecla iroides (Boisduval)
Common in spring.

Thecla dumetorum (Boisduval) "The Green White-spotted Hairstreak." Abundant in spring.

Thecla saepium (Boisduval) "The Hedgerow Hairstreak."
A few specimens were taken or seen in July.

Thecla adenostomatis (Henry Edwards) "The Gray Hairstreak."
One or two were taken or seen in July.

Chrysophanus helloides (Boisduval) "The Purplish Copper."
Quite common.

Lycaena xerces Form polyphemus (Boisduval) "The Eyed Blue."
Common in spring and early summer.

Lycaena sonorensis (Felder) "The Sonora Blue."
One or two taken or seen in April.

Lycaena battoides (Behr) "Behr's Blue." Form bernardino (B. and McD.)
Common in July.

Lycaena acmon (Doubleday & Hewitson) "Acmon."
Common throughout the season.

Lycaena pseudargiolus (Boisduval & Leconte) "The Common Blue." [This is var. echo.—Editor.]
Abundant in spring and early summer.

..Lycaena hanno (Stoll) "The Florida Blue."
One taken on October 20th. [Gyas.—Editor.]

Lycaena marina (Reakirt) "The Marine Blue."
Common in late summer and fall.

Hesperia tessellata (Scudder) "The Checkered Skipper."
Abundant throughout the season.

Pyrgus ericetorum (Boisduval).
One female was taken on June 11th. It reappeared in August but was scarce.

Thanaos tristis (Boisduval).
Not uncommon in the spring.

Thanaes funeralis (Scudder & Burgess) "The Funereal Dusky-wing."
Not uncommon in the spring in company with T. tristis. It reappeared in August.

Thanaos persius (Scudder) "Persius' Dusky-wing."
Common early in October.

Polites sabuleti (Edwards) "The Sand-hill Skipper."
One taken on October 21st.

Pamphila agricola (Boisduval).
A few were taken or seen in June.

Pamphila sylvanoides (Boisduval).
Some seen early in October.

Hylephila phylaeus (Drury) "The Fiery Skipper."
Abundant throughout the season.

Atrytone melane (Edwards) "The Umber Skipper."
Common early in the summer especially in the upper part of the canyon. Reappeared in September and October.

The nomenclature is that of Barnes & McDunnough's "Check List."

Casa Verdugo, Calif.

A STUDY IN ZAUSCHNERIA

By George L. Moxley

This strikingly beautiful genus of western fall-blooming plants has been too little studied, partly because, as Dr. E. L. Greene suggested, we have been told that it consists of a single very variable species, and partly, perhaps, because of its late flowering which brings it into its splendor after the usual collecting season is mostly over. The present study was undertaken primarily for the purpose of satisfying the author as to the relationships of some of the forms and as to the geographical continuity of these forms. About three years ago a brief study was made of some of the local forms, using such material as could be begged, borrowed or otherwise acquired, but, from the meagerness of the material and the fact that most of it came from the same general region, the results were not entirely satisfying. At the beginning of the present year he secured the loan of a large series of specimns from the herbaria of th University of California and the California Academy of Sciences, and somewhat later from the Dudley Herbarium of Stanford University. Smaller lots were borrowed from Pomona College and the Carnegie Museum. These, with his own collection and several specimens contributed from various sources, gave the author nearly 300 sheets for study. These range from Rogue River, Oregon, and the Teton Forest, in Wyoming, on the north, to Sonora and Lower California on the south, and from near sea-level to well up in the high Sierras. In addition to this material, Miss Alice Eastwood, of the California Academy of Sciences, very kindly sent quite a quantity of MSS notes which she made at Gray Herbarium some years ago and had never published. These have had a more or less critical examination during the past few months and the conclusions arrived at are here set forth to be taken at such valuation as may be accorded them.

It should, however, be understood that this is not offered as a revision of the genus. The author would be very reluctant to undertake such a work without having access to the large eastern collections, since many of the forms of Arizona, Mexico and Lower California are but poorly represented in the collections which it has been his privilege to examine.

The literature of Zauschneria is very meager. The first reference seems to have been about 1805, as evidenced by the following quotation from the Botanical Magazine for February, 1850: "Forty-five years ago this handsome plant was alluded to in an excellent memoir on Goniocarpus, published by Mr. Koenig in the 'Annals of Botany' vol. I., p. 543, as existing in the Ranksian Herbarium, 'a beautiful new genus, a native of California, having the flowers of a Fuchsia and a fruit exactly like Epilobium.'" It

seems that no further notice was given to the plant till Presl, in vol. 2 of the Reliquiae Haenkeanae (1831) published it under the name of **Zauschneria,** in honor of Dr. Zauschner, a Professor of Natural History in the University of Prague, naming two species, **Z. Californica** and **Z. Mexicana,** the second somewhat doubtfully. Hooker, in the Botanical Magazine for February, 1850, (t. 4493) described and figured a new variety, **latifolia,** from a cultivated plant. In the Genera Plantarum, vol. I., pt. 3, (1867?), Bentham and Hooker give a somewhat more comprehensive generic diagnosis than the original of Presl. In his Natural History of Plants, vol. 6, (1880), Baillon gives a similar diagnosis. In the Botany of California, vol. I., (1880), the genus is briefly described and one species, **Z. Californica** Presl, and a variety, **microphylla** Gray, are given, together with their distribution as then worked out. In 1887 Prof. E. L. Greene published a paper on "The Species of Zauschneria" (Pittonia i:23-28), in which he called attention to the many forms found in herbaria and proposed five species, four of them new. In his 'Contributions to Western Botany," No. 4, (1893), M. E. Jones criticises to some extent Prof. Greene's position as to the basis of specific distinction and cites some of his own collections in support of his views. With the exception of Torrey and Gray's Flora of North America, which I have not seen, these are all the references, except in distributional lists, that I have been able to locate in the literature of last century.

In 1902 Dr. A. Davidson described a new species, **Z. Arizonica,** from material collected near Metcalfe, Ariz. In 1905 Aven Nelson described Z. argentea from Nevada, and in 1907 he described **Z. Garretti** from Utah. In 1916 the writer described two species, **Z. glandulosa** and **Z. viscosa,** from material collected in the southern California mountains. In 1917 Dr. P. A. Rydberg described **Z. crassifolia** from Arizona and southern Utah. In addition to these already published species I find in Miss Eastwood's MSS. notes some that she described from material in Gray Herbarium that I consider worthy of recognition. There are two or three forms which she has described of which I have seen no material of the collections cited nor any that I could satisfactorily determine as belonging to those forms, and these I omit. I have also found it necessary to describe some forms that would not fit any of the species I have found already described. It has not, however, been the purpose of this study to unduly multiply described forms and, for this reason, I have the rather broadened the specific limits than narrowed them.

It might not be amiss to note that, as Dr. Greene pointed out (l. c.), Presl's plate and description are faulty in that the lobes of the calyx are represented as being reflexed, whereas they are never reflexed but always closly appressed to the petals. Dr. Greene further notes that, in some species, the upper pair of

petals stand erect while the others are parallel to the tube, giving the flower the appearance of being somewhat bilabiate. This, however, is only in appearance as the petals are all the same size and shape. This condition does not obtain in all the forms, many being narrowly funnelform and some quite tubular.

Greene depends chiefly upon the shape, pubescence, venation and insertion of the leaf for the separation of his species, giving little attention to the floral characters. To my mind no one character or set of characters seems sufficient, and in many forms the flower offers a very excellent character whereby to distinguish the species.

It might be pertinent to suggest that this genus, like some other genera of the Onagraceae, is in more or less plastic condition and some of the forms not yet fully "set in their ways." It has more than once been asserted that the forms of Zauschneria are not constant and that a great part of the variation is purely environmental. It would certainly be a very interesting experiment to cultivate these diverse forms under identical conditions for a period of years to establish the truth or falsity of this contention.

Before beginning the consideration of the species I propose to recognize, I wish to gratefully acknowledge the deep obligation I am under to all those who have helped me in any way, and especially to the following persons: Prof. H. M. Hall and his associates of the Department of Botany in the University of California, for the loan of the material in their herbarium. Miss Alice Eastwood, of the California Academy of Sciences, for the loan of material and valued MSS. notes. Prof. L. R. Abrams, of Stanford University, for the loan of material and notes and suggestions. Dr. O. E. Jennings, of Carnegie Museum, Pittsburgh, Pa., for the loan of material. Dr. Aven Nelson, of the University of Wyoming, for original descriptions. Profs. J. C. Nelson and M. E. Peck, of Salem, Oregon, for a specimen from their region. Prof. Philip Munz, of Pomona College, for the loan of material Mr. I. M. Johnston, of Upland, Calif., for material and suggestions. Mr. Frank S. Daggett, Director of the Los Angeles County Museum of History, Science and Art, for his aid in securing much valuable material and for many privileges at the Museum in connection with the study; and to the many friends who have so generously contributed specimens from their collections

Plate 2.
Zauschneria Viscosa Moxley.

Plate 3.
Zauschneria Glandulosa Moxley.

Plate 4.
Zauschneria Pulchella Moxley.

SOUTHWEST MUSEUM

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ZAUSCHNERIA Presl

Calyx superus deciduus, tubo infundibuliformi, cum ovario articulato, colorato, basi supra ovarium globoso-ventricoso, limbo quadripartito. Petala quattuor, summo tubo inserta. Antherae lineares, dorso affixae. Ovarium lineare tetragonum. Stylus sfiliformis. Stigma capitatum, quadrilobum. Capsula linearis tetragona quadrivalvus unilocularis polysperma. Semina oblonga papposa.

Suffrutices decumbentes ramisissimi tomento tenui canescentes. Rami oppositi. Folia opposita angusta. Racemi terminales simplices. Flores sessiles coccinei. In herbaris Banksiana servatum.

Z. Californica Tab. LII. Habitat in California ad Monte Rey.

Tube of the calyx funnelform and deeply colored above the ovary, with a small, frequently globose, base and a four-lobed limb, deciduous, appendaged within with eight small scales, four erect and four deflexed. Petals four, inserted on the throat of the calyx, obcordate or two-cleft, scarlet. Stamens eight exserted; the filaments opposite to the petals shorter; anthers linear-oblong, attached by the middle. Ovary four-celled; style long and exserted; stigma capitate or peltate, four-lobed. Capsule linear, obtusely four-angled, four-valved, and imperfectly four-celled, many seeded. Seeds oblong with a tuft of hairs at the apex.—Low decumbent perennial, somewhat woody at base; leaves sessile (the lower opposite); the large scarlet Fuchsia-like flowers in a loose spike.

KEY TO THE SPECIES

Canescent with a dense white tomentum, hairs (under a lens) short and curly.

Lateral veins not evident.

Leaves narrowly linear 2-3 mm. wide.

Calyx divisions ½ as long as tube — **Californica** 1

Calyx divisions ¼ as long as tube — **cana** 3

Leaves lanceolate-oblong tapering to both ends, flowers small and — **microphylia** 2

Leaves linear-lanceolate to linear-oblong slender — **argentea** 18

Lateral veins edivent.

Leaves lanceolate to ovate, herbage rough-tomentose. — **tomentella** 9

Leaves ovate to broadly oblong, silvery silky. — **veluntina** 8

Foliage green, more or less villous and glandular.

Lateral veins not evident.

Leaves linear-lanceolate, somewhat falcate; capsules glabrous, surpassing bracts. — **villosa** 4

Leaves lanceolate to oblong-lanceolate; capsules glandular-puberulent — **Eastwoodae** 5

Lateral veins evident.

Leaves lanceolate to ovate or elliptical; capsules fusiform, — **latifolia** 6

Leaves cordately clasping at base, mucronate and involute at apex; capsules sessile and tapering at the apex. — **elegans** 13

Leaves cuneate to a sessile base, uncinately mucronate at apex; capsules pedicellate, narrowed but little at apex. — **Garretti** 10

Leaves oblanceolate to elliptic-oblanceolate, acute at each end. — **crassifolia** 14

Leaves broadly ovate; plant slimy-viscid. — **viscosa** 7

Leaves lanceolate; flowers small and slender; capsule densely glandular. — **glandulosa** 15

Leaves ovate, acuminate, pilose; capsules long-beaked. — **Hallii** 16

Leaves lanceolate; flowers tubular, slender. — **pulchella** 17

Foliage pallid; leaves mostly glabrous except on veins and margins; lateral veins evident.

Leaves ovate-lanceolate; stamens and styles long exserted; capsule pedicellate **Arizonica** 11

Leaves lanceolate, acuminate; stamens included; capsule tapering at each end, long-pedicellate. **Pringlei** 12

1. **ZAUSCHNERIA CALIFORNICA Presl.** Rel. Haenk ii:28, t LII. 1831.

Decumbent or ascending, tomentose or frequently softly villous; leaves narrowly lanceolate to linear-oblong, usually less than 2 cm. (rarely 3 cm.) long, 2 to 4 mm. wide, entire or obscurely and remotely denticulate, mucronate, tomentose and more or less hirsute, fascicled in the axils; calyx-tube 18-22 mm. long, constricted above the somewhat globose base, usually narrowly funnelform, somewhat villous or rarerly glabrous; sepals 8-10 mm. long; petals somewhat exceeding the sepals; stamens well exserted; style exserted 10-15 mm.; ovary soft-villous to short-hispid, rarily glabrate, not at all glandular; capsule 20-25 mm. long, more or less hispid, distinctly pedicelled, attenuate to a beak.

The above description was drawn from a suite of specimens, special attention being given to A. D. E. Elmer No. 3391, from Tassajara Hot Springs, Monterey County, June, 1901, and A. D. E. Elmer No. 4039, from Carmel Bay, Monterey County Sept., 1902, since the original plant from which the genus was first described seems to have come from this region. Greene expresses the opinion (Pitt. i:27) that the typical **Z. Californica** of Presl is the plant named var. **microphylla** by Dr. Gray in herb. At my request Dr. Abrams, while at Cambridge last summer, looked up Gray's type and wrote me as follows. "Brewer's No. 38, 1860-62, Los Angeles, is labeled in Dr. Gray's handwriting 'Z. californica var. ? microphylla.' This plant is the common linear-leaved plant of the Los Angeles region. * * * Mounted on the same sheet is a very similar specimen collected by Fremont, Sept. 13, 1846. This has no locality but is labeled 'Zauschneria n. sp.' It came from the Torrey Herbarium and I suspect the writing is Torrey's. A third specimen on the sheet was collected by Torrey 93a, 1865 in Santa Barbara Co. This is not named. It is evident that Brewer's plant must be considered the type." Since the original **Z. Californica** is said to have come from near Monterey I am inclined to disagree with Greene's opinion, although in a former paper (Bull. So .Cal. Acad. Sci. xv:47-54. 1916) I accepted his position, the more so because Presl's plate represents a plant very much more like **Z. villosa** Greene.

Specimens Examined

Tassajara Hot Springs, Monterey Co., June, 1901, A. D. E. Elmer 3391 (DH); Carmel Bay, Monterey Co., Sept., 1902, A. D. E. Elmer 4039 (UC); Monterey Co., 1897, A. L. Bolton (UC); Berkeley, Sept., 1891, Edw. L. Greene (UC); Gavilan Mts., July 5, 1861, Guirado 755 (UC); San Diego Co., Oct., 1897, Mary F. Reynolds (UC); Oak Knoll, Los Angeles Co., Oct., 1902; Ernest Braunton 727 (UC); Lake Temescal, Alameda Co., Aug., 1891, F. T. Bioletti (UC); Yountville, Oct., 1895, Capt. F. L. Clark (UC); Suisun Marshes, Sept. 25, 1897, J. Burtt Davy 4098 (UC); Los Angeles, Cal., Oct. 12, 1915, Geo. L. Moxley 452 (UC, GLM); Los Angeles, Nov., 1901, Miss E. D. Palmer (UC); Stanley's, Santa Clara Co., Sept., 1893, J. Burtt Davy 269 (UC); Tolemas Springs, Solano Co., Aug., 1891, W. L. Jepson (UC); Summit of Mt. Hamilton, July 29, 1899, Harley P. Chandler (UC); San Juan Grades, Monterey Co., Aug. 25, 1916, Abrams 6308 (DH); Coast Trail above Water's, Santa Lucia Mts., Aug. 6, 1903, W. R. Dudley (DH); Pecho Valley, San Luis Obispo Co., Dec. 30, 1893, W. R. Dudley (DH); Mt. Diablo, Contra Costa Co., Oct. 8, 1910, Abrams 4338 (DH); San Jose Canyon, Monterey Peninsula, Dec. 28, 1909, Josephine D. Randall (DH); Santa Cruz Peninsula, Santa

Clara Co., July 17, 1907, Josephine D. Randall (DH); Los Gatos Creek, Santa Clara Co., Oct. 11, 1902, Abrams 3025 (DH); Castle Rock Ridge, Santa Clara Co., Oct. 7, 1906, Abrams (DH); near summit Mt. Hamilton Range, Santa Clara Co., Aug. 14, 1917, Abrams 6656 (DH); Tassajara Hot Springs, Monterey Co., July, 1914, Harriet Hatton (CA); E. Oakland Hills, July, 1899, W. W. Carruth (CA); Glenwood, Santa Cruz Co., 1914, Horace Davis (CA); The Pinnacles, San Benito Co., Oct. 21, 1917, Alice Eastwood 6741 (CA).

San Diego, Sept. 25, 1903, T. S. Brandegee (UC); Switzer Canyon, San Diego Park, Oct. 8, 1905, Katherine Brandegee (UC) Park, San Diego, June, 1906, Katherine Brandegee (PC); The above three specimens vary in their extremely slender habit, with longer and more slender flowers, but are for the present included here.

A specimen labeled Lake Co., 29 Aug., 1888, Edw. L. Greene, (UC), has somewhat longer leaves slightly dentate at the apex, and more slender flowers.

2. ZAUSCHNERIA MICROPHYLLA (Gray). **Z. Californica** var. **microphylla Gray,** in herb.

Erect or ascending, sparingly branched, branches short and very slender, canescent with a fine close pubescence becoming glabrate in age; leaves linear, entire, mucronate at apex, 35 mm. or less in length, 1 to 1.5 mm. wide, densely gray-canescent with a minute appressed pubescence, densely fascicled in the axils; calyx-tube 20 mm. long, constricted to a diameter of 2 mm. 4 mm. above the globose (5 mm. diameter) base, thence broadly funnel-form widening to 8-10 mm. at throat, more or less villous and glandular; sepals 8 mm. long; petals 10 mm. long; stamens scarcely at all exserted; style exserted 5-6 mm.; ovary more or less beset with short-stalked glands; capsule about 25 mm. long, somewhat falcate, pedicellate.

This is the common form around Los Angeles and vicinity. Dr. Abrams kindly looked up the specimen that Dr. Gray named the var. **microphylla** as noted under **Z. California.** It is apparently more closely related to **Z. cana** Greene than to **Z. Californica** Presl, although it might be considered a connecting link between them, having the foliage more like the latter and the pubescence more of the former. However in its floral characteristics it is quite distinct from either. A specimen collected on the slopes of Cahuenga Peak, near Los Angeles, Sept. 1, 1919, by the writer, has the tube again constricted just at the insertion of the petals, giving the flower a somewhat saccate appearance.

Specimens Examined

Los Angeles, W. H. Brewer 38 (UC); Bank of Arroyo Seco, near Pasadena, J. & H. W. Grinnell 375 (UC); Los Angeles, 1901, Miss E. D. Palmer (UC); San Gabriel Mts., W. H. Brewer 45 (UC); Santa Monica, Los Angeles Co., J. Burtt Davy 2730a (UC); Griffith Park, Los Angeles, Ernest Braunton 717 (UC); Santa Monica Forestry Station, J. H. Barber 39 (UC); Mountain Drive, Santa Barbara, Abrams 4159 (DH); Loma Alta, Santa Barbara, Sept. 15, 1916, S. B. Parish 11072 (DH); Santa Barbara, May, 1889, Brandegee (DH); Cahuenga Pass, near Los Angeles, Sept. 9, 1917, F. Grinnell Jr. (DH); Elysian Park, Los Angeles, Sept. 2, 1904, Abrams 4179 (DH); Negro Canyon, near Pasadena, Sept. 23, 1917, F. Grinnell Jr. (DH); Mission Canyon, Santa Barbara, Sept. 11, 1916, Parish 11002 (DH); Big Santa Anita Canyon, Alt. 3700 ft., Aug. 12, 1917, F. Grinnell Jr. (DH, PC); Mt. Wilson Trail, Santa Anita Canyon, Dec. 31, 1905.F. Grinnell Jr. 107 (DH); Spanish Canyon, near Monrovia, Dec., 1907, W. R. Dudley (DH); Santa Monica Canyon, Aug. 21, 1901, Abrams

(DH); Santa Monica, Oct., 1881, S. B. & W. F. Parish 556 (DH, Car. Mus.); Echo Mountain, near Pasadena, Nov., 1915, F. Grinnell Jr. (CA); Duarte, Los Angeles Co., Aug. 25, 1915, Alice Eastwood 4893 (CA); San Diego Co., Apr., 1913, O. F. Sanford (CA); San Jose Hills, Nov. 3, 1918, L. Street (PC); Eaton Canyon, Los Angeles Co., Sept. 4, 1916, Geo. L. Moxley 516 (PC, GLM); Placerita Canyon, near Newhall, Dec. 19, 1918, F. Grinnell Jr. (PC); Sawpit Canyon, near Monrovia, Sept. 6, 1915, Geo. L. Moxley444 (GLM); Sierra Madre, without date, Miss Mohr (LAM); Laurel Canyon, 1900, Mr. and Mrs. Grout (LAM); Bailey Canyon, San Gabriel Mts., 1911, F. Grinnell Jr (LAM); Ridge west of Cahuenga Peak, Sept. 1, 1919, Geo. L. Moxley 716 (GIM).

3. ZAUSCHNERIA CANA Greene. Pittonia i:28. 1887.

In his original description Greene says the leaves are entire but I have found in some specimens that they are rarely mucro-denticulate near the apex. Miss Eastwood also points out in her MSS. notes that they are sub-falcate and sub-carinate, the mid-vein being very distinct on the under side of the leaf.

....

Specimens Examined

Santa Cruz Island, July-Aug., 1886, Edw. L. Greene, Type in Herb. Cal. Acad.; also same collection (UC, DH); Santa Cluz Island, Aug. 11, 1916, Mrs. Chas. E. Miller (CA); Anacapa Island, 1901, H. Hemphill (UC).

4. ZAUSCHNERIA VILLOSA Greene. Pittonia i:27., 1887.

Greene's description is faulty in respect to the capsule, which he says is glabrous. The capsule in sheet 30238 of the Dudley Herbarium, distributed as part of the type specimen, is densely villous with straight white hairs, and even in the type sheet, Cal. Acad. 27869, the capsules are somewhat hairy.

Specimens Examined

Santa Cruz Island, Aug., 1886, Edw. L. Greene, type (CA); Same collection (DH); Santa Cruz Island, July 16-17, 1917, Alice Eastwood 3959 (CA); San Clemente Island, June 25, 1894, Edgar A. Mearns 4081 (DH); Island of Santa Rosa, Coast of California, 1888, T. S. Brandegee (UC); San Clemente Island, Aug. 25, 1894, T. S. Brandegee (UC); Ensenada, Lower California, Nov., 1902, T. S. Brandegee (UC) has smaller and shorter leaves and a finer tomentum than the type, but is probably best included here.

5. ZAUSCHNERIA EASTWOODAE sp. nov. Eastwood and Moxley

Green, glandular-pubescent and somewhat villous; stems 5 dm. high, decumbent to ascending, branches ascending with short, very leafy branchlets in all the axils; leaves opposite, floral alternate, sessile, narrowly lanceolate, the largest 3.5 cm. long, 4 mm. wide, apex aristulate, entire or rarely denticulate near the apex, the midvein trinervate below; calyx 4 cm. long, including the lobes 1.5 cm. long, minutely glandular-pubescent, apex stellate in bud, the tube constricted 7 mm. from the bulb about 3 mm. in diameter, the bulbous base 3-4 mm. in diameter, tube widening to 7 mm. at throat; stamens exceeding the petals 8-9 mm.; style exceeding the petals 15 mm.; ovary longer than the floral leaf, apex 1 mm. wide, short-pedicellate; capsule fusiform, 3-4 cm. long, costae red, conspicuously glandular.

Santa Clara Co., Calif., on hills back of Los Gatos, collected by A. A. Heller, Sept. 18, 1903, No. 7211; Type in Herb. Gray. Also specimen collected on the summit of the Coast Range, San Mateo Co., Oct. 20, 1902, by C. F. Baker, No. 52. This is less villous than the type. Also Jolon, Monterey Co., collected by T. S. Brandegee in 1886. This is a poor specimen with flowers apparently shorter than the type.

Miss Eastwood had named this form **Z. glandulosa** in her MSS but the name was preoccupied and I have given it the above name in her honor. The description and the species are hers and the name is mine.

Specimens Examined

Heller, no. 7211 (UC, PC, DH); Baker, no. 52 (UC, PC); Hernandez, San Benito Co., Aug. 20, 1902, Laura M. Lathrop (DH); Mt. Diablo, Contra Costa Co., Oct. 8, 1910, Abrams 4342 (DH).

6. ZAUSCHNERIA LATIFOLIA (Hook.) Greene. Pittonia i:25. 1887.

Z. Californica Watson, Bot. Cal. i:218 in part; **Z. Californica** var. **latifolia** Hook., Bot. Mag. t. 4493.

This is the species of the higher mountains and has a very wide range. There are several forms that might well be separated out as varieties, but it is a difficult task and the author has not undertaken it as yet. Doubtless some students will think that it should be divided into two or more species. Miss Eastwood, in her MSS notes, has named one of the forms **Z. lanceolata,** taking Baker's No. 3657, from the San Antonio Canyon, near Claremont, as the type, but I find so many intermediate forms in the same general region that I am constrained to merge this form into **latifolia.**

Specimens Examined

Placer Co. Aug.-Oct., 1892, A. M. Carpenter (UC); Clark's, among rocks, on Merced River, June-Sept., 1866, H. M. Bolander 5014 (UC); Alamos Mt., Ventura Co., 6500 ft., July, 1905, H. M. Hall 6708 (UC); Middle Fork, King's River, Sept. 4, 1901, Ralph Hopping 130 (UC); Slippery Ford, El Dorado Co., Sept. 23, 1913, Abrams 6845 (DH); Mt. Gleason Summit, July 11, 1897, J. H. Barber 252 (UC); Strawberry Creek, San Jacinto Mt., 5500 ft., July 17, 1897, H. M. Hall 694 (UC); Santa Rosa Mt., El Torro Peak, 8200 ft., July 30, 1897, H. M. Hall 763 (UC); San Bernardino Mts., Aug. 1891, W. C. Blasdale (UC); San Antonio Canyon, near Claremont, Aug. 2, 1903, C. F. Baker 3657 (UC); Coldwater Canyon, San Antonio Mts., July 13, 1902, Abrams 2715 (DH); without locality, dry sandy soil, alt. 400 m., June 18, 1908, Elizabeth Colson 43 (PC); Lyttle Creek Canyon, San Bernardino Mts., 2500 ft. alt., July 15, 1902, Abrams 2748 (DH); Bear Valley, San Bernardino Co., Aug. 3, 1901, Abrams 2082 (DH); Mt. Lowe, San Gabriel Mts., July 29, 1917, F. Grinnel Jr. (DH); Russel's Lake, Los Angeles Co., July 8, 1913, Abrams 5019 (DH); Mt. Wilson, Sept. 1, 1913, Moxley 180 (GIM); Stoddard's Canyon, alt. 2250 ft., Dec. 5, 1917, I. M. Johnston 1805 (GLM); Mt. San Antonio, Aug., 1916, F. Burley (GLM); San Antonio Canyon, alt. 7500 ft., July 20, 1917, I. M. Johnston 1586 (GLM); Arroyo Seco Canyon, Sept. 7, 1914, Moxley 281 (GLM); San Bernardino Mts., July, 1911, Miss Mohr (LAM).

A speciment collected in Rogue River Canyon, Oregon, at the mouth of Mule Creek, June 26, 1917, by Prof. Morton E. Peck, no. 7596, bears a strong resemblance to Hooker's plate (t. 4493) of his var. **latiofolia** even to the very leafy inflorescence. The leaves are perhaps a little broader in proportion to the length, but, on the whole, it is best placed here.

7. ZAUSCHNERIA VISCOSA Moxley. Bull. So. Cal. Acad. Sci. xv:22. 1916.

Differs from **Z. latifolia** in the broadly ovate and somewhat acuminate leaf and the extremely slimy-viscidity of the whole plant.

Specimens Examined

Moxley 412, type, (GLM, LAM, UC); Mt. Wilson Ridge, 5800 ft., July 29, 1917, F. Grinnell Jr. & Chas. F. Richter (GLM).

8. **ZAUSCHNERIA VELUTINA** sp. nov. Eastwood in MSS.

Densely silvery appressed-tomentose throughout; stems 4-5 dm. high, branching from the base; branches with alternate leaves and very short branchlets in all the axils; leaves lanceolate to elliptic lanceolate, the floral ovate, the largest 3 cm. long, 10 mm. wide, apex acute and with a yellow mucro, the base narrowly sessile, margin entire or obscurely mucronate-dentate, lateral veins in the larger leaves distinct, in the small obscure; calyx about 2.5 cm. long, tomentose, the lobes 8 mm. long, apex obscure in the bud, tube 3 mm. in diameter above the globose bulb windening to 6-7 mm. at throat; petals slightly exceeding the calyx; stamens exceeding the petals 2-6 mm.; style clavate; ovary shorter than the floral leaves, narrow at base, short-pedicellate, apex scarcely narrowed about 5 mm. long, appressed-tomentose.

Collected on the banks of the Russian River, north of Cloverdale, in Mendocino County, California, July 9, 1902, by A. A. Heller, no. 5829. Type in Herb. Gray.

"This is perhaps closely allied to **Z. tomentella** Greene, differing in the petals almost equalling the calyx-tube, instead of being half as long, the calyx-tube rather thick than slender and the distinctly pedicelled ovary. The pubescence can in no way be considered rough, for it is distinctly velvety, silvery and silky. It is more closely allied to the thicker tubed coast species than the slender tubed Sierra ones."

Specimens Examined

Banks of the Russian River, Mendocino Co., July 9, 1902, Heller 5829 (DH); Mt. Hamilton Range, Santa Clara Co., Aug. 14, 1917, Abrams 6638 and 6656 (DH); South Yorba Flume, Nevada Co., Aug. 8, 1909, W. R. Dudley (DH); Eldorado Co., Sept. 11, 1915, Heller 12265 (DH, CA); Placer Co., Aug. 13, 1917, Heller 12899 (DH); Glen Alpine, Lake Tahoe Region, 6800 ft., Aug. 15, 1909, E. A. McGregor 131 (DH); Old Colony Mill, Giant Forest Park, Aug. 30, 1905, Katherine Brandegee (UC).

9. **ZAUSCHNERIA TOMENTELLA** Greene. Pittonia i:26. 1887.

Specimens Examined

Type sheets Nos. 27867 and 27868 (CA); Yosemite, July, 1895, J. B. Lembert (UC); Placer Co., 1893, Mrs. M. M. Hardy (UC); Oakland Reservoir, July 20, 1874, F. P. McLean (UC); near Sespe Hot Springs, July 2, 1896, W. R. Dudley & F. H. Lamb (DH); Berkeley, Sept., 1891, Edw. L. Greene (DH); Angel Island, Oct., 1888, K. Brandegee (DH); Loma Prieta, Santa Clara Co., Aug., 1903, A. D. E. Elmer 4491 (DH); Dulzura, San Diego Co., June 13, 1895, Miss S. G. Stokes (DH); Sierra Co., 1874, J. G. Lemmon (Car. Mus.)

10. **ZAUSCHNERIA GARRETTI** A. Nelson. Proc. Biol. Soc. Wash. xx:36. 1907.

Of this species I have not seen the original description, but I have a description drawn up by Miss Eastwood from a duplicate of the type, in Gray Herbarium. There was also a specimen in some material I borrowed from Mr. Parish, when I made my previous study, which was collected by Chas. P. Smith and determined by A. Nelson so that I think I know what it is like.

Specimens Examined

Salt Lake, Cottonwood Creek, June 27, 1918, Alice Eastwood, 7789, the type locality, (CA); Cache Co., Utah, Logan Dry Canyon, Aug. 8, 1909, Charles Piper Smith no. 1987 (Parish Herbarium).

11. **ZAUSCHNERIA ARIZONICA** Davidson. Bull. So. Cal. Acad. Sci. i:5. 1902. Plate 1.

Specimens Examined

Metcalf, Ariz., in Creek bottom, 5000 ft., Oct. 10, 1900, Davidson 365, type, (UC, LAM); Hauchuca Mts., Ramsey Canyon, 5400 ft., Sept. 20, 1896, Forrest Shreeve 5063 (UC, CA); Elder Mts., Ariz., Sept. 1902, C. A. Purpus (UC); Frick Park, Bisbee, Ariz., June 5, 1915, John I. Carlson (CA); Santa Rita Mts., Ariz., Nov. 1891, T. S. Brandegee (UC); Paradise Falls, Chiricahua Mts., Ariz., Oct. 4, 1907, J. C. Blumer 1760 (DH); Stone Cabin Canyon, Santa Rita Mts., Ariz., 5000 ft., Sept. 11, 1903, Thomber No. 12, (UC); Price Canyon, Chiricahua Mts., Ariz., July 22, 1907, Leslie Goodding 2307 (UC).

12. **ZAUSCHNERIA PRINGLEI** sp. nov. Eastwood in MSS.

Stems slender, branching virgately above, pilose with long white spreading hairs, and glandular-pubescent on the flowering branches; leaves pale green, thin, lower ones lanceolate, acuminate, narrowed to a sessile base, longest 3 cm. long, 6 mm. wide, lateral veiny, floral leaves linear-lanceolate, 2 mm. wide, shorter than the ovary but surpassing the pedicels, sparingly denticulate with teeth callous and uncinate, apex uncinately mucronate, flowers many, corymbose in bud, racemose-spicate in fruit; calyx about 3 cm. long, lower part glandular-puberulent, divisions exteriorly appressed pubescent, tube 4 mm. long (to interior appendages), throat 15 mm. long, expanding from 2-7 mm., divisions extending almost to insertion of petals, 1 cm. long, 2-3 mm. wide at base, mucronate tips in bud connivent; petals 8-9 mm. long, 5 mm. wide near top, bifid 1 mm. with closed sinus and rounded lobes, claw 2 mm. wide; filaments unequal, anthers included or rarely slightly exserted; style exserted 5 mm.; ovary very slender, glandular and sparingly pilose; capsule tapering at each end, pedicel 4-5 mm. long, slender; seeds apparent through walls.

Type collected at Los Pinitos, Sonora, Mexico, Oct. 12, 1890, 6100 ft. alt., by C. V. Hartman, no. 144. Expedition under Dr. Carl Lumholtz. Specimen no. 126, of same collection, has two forms, one agreeing with the foregoing description, the other with leaves almost entire, stamens exserted and corolla with lobes 4 mm. long, sinus closed, petals 10 mm. long.

Specimen Examined

13. **ZAUSCHNERIA ELEGANS** sp. nov. Eastwood in MSS.

Minutely glandular-pubescent and with a few long spreading hairs; stems cymose-branching, branchlets opposite in all the axils, the upper with cymose inflorescence; leaves all opposite, oblong-lanceolate, the upper ovate, the largest 3 cm. long, 15 mm. wide, cordate-amplexicaul at the base, and also somewhat decurrent! apex acuminate-involute and mucronate, margin serrate with callous teeth, 1-4 mm. apart, lateral veins conspicuous; flowers corymbose opposite; calyx exteriorly glandular-pubescent, about 3 cm. long, apex conspicuously stellate in bud, tube cylindric 1 mm. in diameter 5 mm. above the small bulb (bulb about 2 mm. in diameter) widening to 5-6 mm. at the throat; petals 1 cm. long, slightly exceeding the calyx, sinus 4 mm. long, closed, lobes 3 mm. wide, parallel; stamens equalling the petals; style exserted 8-9 mm.; ovary slenderly fusiform; capsule falcate, short-pedicellate, about 2 cm. long, 2 mm. broad, with reddish costae; immature seeds obovate.

Kern Canyon, Tulare County, California. Collected by C. F. Culbertson, July 30, 1904. No. 4220. The species is related to **Z. latifolia** (Hook.) Green, differing in the almost complete absence of the spread-

ing pilose pubescence, the cordate-clasping bases of the leaves, the uniformly opposite leaves, the peculiar apex and marginal teeth, and the conspicuously stellate tips of the calyx division in bud.

Specimens Examined

Kern River Canyon, Tulare Co., July 30, 1904, C. F. Culbertson 4220 (UC, DH, PC, CA); Region of Kern River and Kern Lakes, July 19, 1897, W. R. Dudley (DH); Lloyd Mountain, Sequoia Grove, July 21, 1895, W. R. Dudley (DH); Basin of Upper Kern River, Tulare Co., Aug. 2, 1904, Hall & Babcock 5576 (UC); Kings River Canyon, Summer, 1898 R. A. Gibbs (UC); Sardine Creek, Southern Sierra Nevada, Aug. 18 Mrs. Austin 353 (UC).

14. ZAUSCHNERIA CRASSIFOLIA Rydberg. Flora of the Rocky Mountains and Adjacent plains, 590, 1064. 1917.

Specimen Examined

Teton Forest Reservation, Wyoming, July-Aug., 1897, T. S. Brandegee (UC).

15. ZAUSCHNERIA GLANDULOSA Moxley. Bull. So. Cal. Acad. Sci. xv.22. 1916.

This was described from a specimen collected by Winifern W. Swarth on a ridge south of Strawberry Valley, San Jacinto Mts., Sept. 0, 1914. In the summer of 1917 Mr. F. M. Fultz collected a plant at Idlewyld that was compared with the type sheet by Prof. H. M. Hall, who reports that it is as near like it as two plans can well be. Another sheet that I refer here without hesitation is in the herbarium of Pomona College, collected in Bear Valley, June 1, 1917, by Edwards.

16. ZAUSCHNERIA HALLII sp. nov.

Decumbent and branching from the base, 1-3 dm. high; herbage densely pilose with spreading white hairs; leaves ovate, sharply denticulate, acuminate, usually terminating in an uncinate mucro, pilose on both surfaces and densely so on the veins, rarely becoming glabrate in age, the largest 22 mm. long, and 10 mm. wide; calyx-tube 11-13 mm. long, narrowly funnelform, slightly constricted 3 mm. above the ovary, widening to 4-5 mm. at the throat; sepals 7 mm. long, the tips stellate in bud; petals 8 mm. long; stamens exserted 1 mm.; style exserted 5 mm.; ovary equaling its bract, quadrangular in section, tapering abruptly at each end; capsule 18 mm. long, evidently short-pedicellate, attenuate to a long (5 mm.) frequently curved beak.

San Jacinto Mts., Southern California, ridge at west side at 6700 ft. altitude, July, 1901, H. M. Hall, No. 2567, type; also Rocky ridges and peaks near Tahquitz, alt. 7000 ft., June-July, 1901, H. M. Hall, No. 2330. Both sheets in the herbarium of the University of California.

In the first specimen, which I have selected for the type, the flowers are very strikingly colored, the calyx-tube being a dull red, the sepals scarlet and the petals a dark purplish maroon. The capsular shape is a very noticeable character and distinct from any form that has come under my observation, resembling the seed pods of Martynia. The last specimen lacks the strikingly colored petals and is somewhat less villous but is otherwise identical with the type.

17. ZAUSCHNERIA PULCHELLA sp. nov.

Stems simple, apparently 1-5 dm. or less in height, densely hirtellous above with white divaricate hairs, glabrate below; internodes one half the leaf length or less; leaves narrowly lanceolate, 25 mm. long, 5 mm. or less wide, hirtellous on both surfaces and ciliate on the margins with short white hairs, margin entire or with one or two minute callous teeth, acute and tipped with a brown uncinate mucro, lateral veins obscure, but

distinct in transmitted light; cauline leaves opposite, floral alternate, inflorescence leafy; calyx-tube 15 mm. long, 1-1.5 mm. thick at base, cylindrical 7 mm. thence broadening to 3 mm. at the throat, glandular-pubescent, tips obscure in bud; sepals narrowly lanceolate, 5 mm. long, hairy at tip; petals 8 mm. long, narrowly obcordate, the sinus apparently closed; stamens exserted 3-5 mm., anthers pink; style exserted 4 mm., perhaps tardily longer; ovary cylindrical, densly glandular-pubescent, two-thirds the length of its leafy bract; the whole flower, including the ovary, a deep scarlet; capsule undeveloped.

Collected near Willoughby Mine, Gold Lake Region, Plumas Co., California, Aug., 1919, by Mrs. E. C. Sutliffe. Type in the Herbarium of the California Academy of Sciences. Known only from the type locality, where it is said to be, at least locally, abundant.

18. ZAUSCHNERIA ARGENTEA A. Nelson. Proc. Biol. Soc. Wash. xviii:173-174. 1905.

Specimen Examined

Broncho Creek, Washoe Co., Nevada, Aug. 17, 1904, P. B. Kennedy 896, the type collection. (UC).

The four foregoing species form a very interesting group, all being small and slender flowered forms. They are, however, quite distinct. **Z. Hallii** differs from **Z. glandulosa** in the shape of the leaf, the stamens and style less exserted, and the remarkably shaped capsules. **Z. pulchella** is very distinct from either of these forms and, from the description, I judge it to be as much so from **Z. argentea,** although I have not had the opportunity of comparing them, as the University of California material was sent home before the specimen from which I described **Z. pulchella** was sent me by Miss Eastwood, with the intimation that she considered it a new species, in which opinion I heartily concur.

Several forms from Sonora, Mexico, southeastern Arizona and Lower California I have left undetermined because of scanty material and lack of authentic specimens of **Z. Mexicana** Presl. It appears to me that there are at least three good species in the specimens that came under my observation. I am, however, leaving all this group for future consideration.

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Specimens Cited

The abbreviations of the various herbaria containing the specimens cited are as follows: University of California (UC), California Academy of Sciences (CA), Dudley Herbarium of Stanford University (DH), Pomona College (PC), Los Angeles County Museum LAM), Carnegie Museum, Pittsburgh, Pa. (Car. Mus.), the author's private herbarium GLM).

EXPLANATION OF PLATES

Plate 2. **Zauschneria viscosa** Moxley. The type sheet in the author's private herbarium. Photo by the author.

Plate 3. **Zauschneria glandulosa** Moxley. The type sheet, No. 188980 in the University of California herbarium. Photo by the author.

Plate 4. **Zauschneria pulchella** Moxley. The type specimens in the herbarium of the California Academy of Sciences, Golden Gate Park, San Francisco, Calif. Photo by the author.

ADDENDUM

Zauschneria canescens Eastwood, sp. nov.

Villous-canescent, 3-4 dm. high, branching near the base, with spicate-congested inflorescence; leaves opposite, oblong-ovate, 2-3 cm. long, 5-15 mm. wide, with acute apex and obtusely sessile base, margin mucronate-denticulate, lateral veins obscure; calyx 22 mm. long, its divisions scarcely 1 cm. long, acuminate, equaling or exceeding the petals and stamens, the bulb at the base 2-3 mm. in diameter; ovary shorter than its bract, broadly fusiform; capsule villous, sessile.

Type collected by Culbertson in the South Fork of the Kaweah River, Tulare County, California, July 22, 1904, and distributed by C. F. Baker under his No. 4502.

This species resembles **Z. velutina** Eastw. in the character of its pubescence except that it much more rough and coarse. It differs from it in the shape of the leaves, which are ovate-acuminate rather than elliptical, in the congested inflorescence, and the included stamens. In the systematic arrangement it should come between **Z. tomentella** Greene and **Z. velutina** Eastw.

Specimens Examined

Baker 4502 (CA, PC); Ricks in Middle Tule River, 3400 ft., C. A. Purpus 5617 (UC); Little Kern River, 9300 ft., Sep., 1897, C. A. Purpus 5226 (UC).

After the above paper was sent to the printer I discovered that this species had been overlooked and, rather than change the body of the paper, I decided to add the description in this way.

MELITAEA SABINA, WRIGHT.

Dr. John Comstock

Some time ago I received a number of examples of a Melitaea that had been taken in the Chiricahua Mountains of Arizona. In endeavoring to identify these I was for some time convinced that they represented a new species. The form showed close relationship to gabbi, which led me to a consideration of and comparison with Wright's Melitaea sabina. This species is shown in Wright's plates by an unrecognizable wreck, and the author's description is about as incomplete as the picture. A typical female was selected from among my series and forwarded to the San Francisco Academy of Sciences, where Prof. E. P. Van Duzee very kindly compared it with Wright's type. He writes me that the species is "certainly the same as M. sabina of Wright." I take pleasure, therefore, in giving a detailed description of this Melitaea, and figuring three specimens in color.

Melitaea sabina, W. G. Wright ,Butterflies of the West Coast, 1905. Plate XX, Fig. 181). Our figure, Plate I, Nos. 1, 2, 3.

Male: Upper Side: Uniform yellow-brown overlaid with blackish lines.

Primaries: Fringes black at ends of nervules, alternating with whitish between. A double marginal line, tending to fuse at the apex, and shaded internally. Medial to this, an irregular submarginal line extending nearly or quite to inner border. This line widens laterally at the juncture of the nervules, thus transforming the yellow-brown ground color into a submarginal row of crescents. Medial to this, the limbal area is crossed anteroposteriorly by an incomplete and variable irregular line, widest toward the costal margin. The limbal area is bordered medially by a heavy black wavy line in the form of a bracket }. The anterior (costal) part of this is broad, oblongate; the central part swings abruptly inward along the posterior edge of the disc; the posterior part swings laterally to its juncture with the heavily shaded inner margin. The disc is marked on its outer portion by an ovate or irregular spot bordered with black. A zigzag line crosses the disc medially, and irregular pencilings mark the basal area.

Secondaries: upper side: Fringes as in primaries. A clearly defined marginal double line. The limbral area crossed by two fine irregular lines, the outer one inclining laterally at the juncture of each vein and nervule. These two lines subdivide the limbal area into three yellow-brown bands that are interrupted by the finely shaded nervules; the outer of these is defined as a row of wide crescents; the middle is a trifle darker in ground color. The basal area is heavily shaded with blackish scales, particularly on its inner aspect; this scaling is irregular in the outer part of the area, giving it a blotched appearance.

Male, underside: primaries: Ground color yellow-brown. Marginal line incomplete toward inner (anal) margin. A submarginal row of crescents, the anterior five pearly white. Medial to this row, a blackish shading. Limbal and discal areas clear yellow-brown except for partial delicate black lineation of the nervules, and an area along the costal margin. A black cuboid spot next to costal margin of this area is bordered laterally by two small pearly-white spots, and medially by a yellow area. Just lateral to outer margin of disc, an oblongate black spot. Disc crossed by two delicate black lines. Inner (anal) margin lighter than ground color. A black irregular spot in the discal area between the submedian vein and first median nervule.

Underside, secondaries: Ground color yellow-brown, overlaid by a series of pearly-white spots and bands, the latter giving a predominant pearly lustre to the wing. Fine double marginal line, bordered medially by a row of seven lunate pearly-white spots. Medial to this, a band of yellow-brown spots, shaded outwardly with fine yellow scales and margined with black. Medial to this a broad band of pearly-white oblongate spots, delicately margined with black. The discal and basal area, predominantly yellow-brown, with several lustrous spots overlaid thereon, the latter finely margined with black.

Antennae: Brownish-black, the club black, tipped with brown. Thorax blackish-brown above, greyish below. Legs and palpi, yellow-brown. Abdomen blackish-brown, annulated with yellow-brown. Below greyish white.

Female: Differs from the male as follows: expanse, 1½ to 1⅝ inches: 37.5 to 41 mm. Above, black lineations lighter and tending toward suppression in certain areas. Ground color a shade lighter and more uniform. In the limbal area on upper side of secondaries there is a tendency for less of the dark lineations, giving the wing a more open appearance. Basal area lighter.

Sabina differs from gabbi, its nearest relative, in several important particulars. The pearly-white spots on the under side are much less lustrous in sabina. Those on the apex of primaries are five in number, are large, well defined crescents, and are in alignment, whereas in gabbi these lunules are reduced, the anterior three only being prominent, the next two much closer to the margin and very small. On the secondaries the submarginal row of pearly lunules is relatively a little larger in sabina. The black shading internal to this row is more pronounced in gabbi. The female of sabina suggests a close relationship to neumoegeni, particularly in its uniform ground color and lighter lineation. The male, on the other hand, shows close gabbi affinity. Perhaps it may develop that Southern Arizona represents the evolutionary habitat from which divergence oc-

curred in the one direction toward an alpine and semi-humid form resulting in gabbi, and in the other a distinctly arid type—neumoegeni.

The type locality of Sabina is the Catalina Mountains (Sabina Canyon). My specimens were taken in a range to the south and east of that point.

The plate is slightly more reddish-brown than the specimens, but is otherwise a good representation. It is slightly reduced.

NOTES ON INDIGENOUS SPECIES OF HAWAIIAN BUTTERFLIES

The Hawaiian Islands are poorly represented in Butterflies, there being only two species which are indigenous, viz:—

Vanessa kameamea (Escr.)

This fine insect, named after the celebrated Hawaiian King who brought all the Islands of the group under one sovereignty, is fairly common, being found in the lower forest zones of the mountains.

Like most of the Lepidoptera in the Islands it is to be found in the mountains throughout the year flitting along the sunlit trails, or circling high up amongst the branches of the trees in company with others of its species. It occasionally settles on a lichen covered trunk or branch, and when in this position it is difficult to discern, so closely do the colours of the closed wings harmonize with the surroundings.

According to Meyrick in the "Fauna Hawaiiensis" this insect is an intermediate form between Vanessa cardui and the Vanessa callirrhoe which is found in the Canary Islands.

The larva, which is a handsome insect, has a habit of folding the margins of the leaves of the food plant (Pipturus albidus) together in order to form a shelter from which it emerges to feed.

The second species is:

Lycaena blackburni (Tuely).

This very beautiful little "Blue" is also found in the mountains, the larvae feeding on the leaves of the Koa Tree (Acacia koa).

The undersides of the wings are a beautiful green. At times this butterfly is quite abundant, and I have seen a dozen or more flying around and settling on a small bush of the food plant.

Meyrick places this species in the group of L. argiolus of Europe and Northern Asia.

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